

APPENDIX 11B. NATIONAL EQUIPMENT AND OPERATING COSTS

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APPENDIX 11B. NATIONAL EQUIPMENT AND OPERATING COSTS

11B.1 INTRODUCTION

In this appendix, the Department presents the components of the net present value (NPV), namely, the present value of the equipment (or total installed costs) and the present value of the operating costs for each of the four appliance products. The present value of equipment costs is also termed the cumulative national equipment costs while the present value of operating costs is also termed the cumulative national operating costs.

As presented in Chapter 11, National Impact Analysis, the NPV is described by the equation:

$$NPV = PVS - PVC$$

where:

- PVS = Present value of operating cost savings (including energy, water, repair, and maintenance costs) and
 PVC = Present value of increased total installed costs (including equipment and installation).

The PVS and PVC are determined according to the following expressions:

$$PVS = \sum OCS_y \times DF_y$$

$$PVC = \sum TIC_y \times DF_y$$

where:

- OCS = Total annual operating cost savings each year summed over vintages of the product stock,
 TIC = Total annual installed cost increases each year summed over vintages of the product stock,
 DF = Discount factor in each year, and
 y = Year in the forecast (i.e., 2012 to 2042).

PVS and PVC are determined for each year from the effective date of the standard to the year when units purchased in 2042 retire.

The present value of operating costs and the present value of equipment costs (or total installed costs) are the components comprising the PVS and PVC , respectively. The PVS is

determined by taking the difference between the present value of operating costs for the base case and the present value of operating costs for the standards case. The *PVC* is determined by taking the difference between the present value of equipment costs for the base case and the present value of equipment costs for the standards case.

11B.2 RESULTS

For following sections provide tables showing the present value of operating costs (also known as the cumulative national operating costs) and the present value of equipment costs (also known as the cumulative national equipment costs) each of the four appliance products. For each product, two sets of results are presented; one based on a seven-percent and another based on a three-percent discount rate.

In the tables provided in the following sections, the national operating and equipment costs are presented for the base case (i.e., without standards) and each standard level analyzed. Differences between the base case and standards cases are also presented. The difference in the national equipment costs represents the *PVC* or present value of equipment cost increases while the difference in the national operating costs represents the *PVS* or present value of operating cost savings. The difference between the base case and standards case total national equipment and operating costs represents the *NPV*.

11B.2.1 Cooktops

Tables 11B.2.1–11B.2.6 present the national equipment and operating costs, *PVC*, *PVS*, and *NPV* for cooktops. In the case of electric and gas cooktops, because the housing market is fully saturated (i.e., all households have cooktops either in the form of ranges or stand-alone units), DOE assumed that standards would neither impact shipments nor cause shifts in electric and gas cooktop market shares. Therefore, DOE’s standards case shipments for electric and gas cooktops were identical to its base case shipments. Typically, DOE would use the standards case shipments projection and, in turn, the standards case equipment stock, to determine the *NPV* to avoid the inclusion of savings due to displaced shipments. But because DOE assumed no drop in shipments due to standards, DOE maintained the use of the base case shipments to determine the annual energy consumption in the base case. Thus, the base case values shown in Tables 11B.2.1–11B.2.6 do not vary with the standards case.

Tables 11B.2.1 and 11B.2.2 show the costs, *PVC*, *PVS*, and *NPV* for electric coil cooktops at real discount rates of seven- and three-percent respectively. Both the candidate standard level (CSL) and trial standard level (TSL) are identified in the following tables.

Table 11B.2.1 Electric Coil Cooktops: Cumulative National Equipment and Operating Costs with NPV from 2012–2042, Seven-Percent Discount Rate (billion 2006\$)

Standard Level*	Equipment	Operating	Total
Base Case	5.29	6.40	11.70
CSL 1 / TSL 2, 3, 4	5.38	6.23	11.61
Difference**	-0.09	0.17	<i>0.09</i>

* TSL 1 equals the baseline level.

** Equipment Cost Difference represents the *PVC*; Operating Cost Difference represents the *PVC*; *NPV* is represented by the bold and italicized values.

Table 11B.2.2 Electric Coil Cooktops: Cumulative National Equipment and Operating Costs with NPV from 2012–2042, Three-Percent Discount Rate (billion 2006\$)

Standard Level*	Equipment	Operating	Total
Base Case	10.16	14.32	24.48
CSL 1 / TSL 2, 3, 4	10.33	13.86	24.19
Difference**	-0.16	0.46	<i>0.30</i>

* TSL 1 equals the baseline level.

** Equipment Cost Difference represents the *PVC*; Operating Cost Difference represents the *PVC*; *NPV* is represented by the bold and italicized values.

Tables 11B.2.3 and 11B.2.4 show the costs, *PVC*, *PVS*, and *NPV* for electric smooth cooktops at real discount rates of seven- and three-percent respectively.

Table 11B.2.3 Electric Smooth Cooktops: Cumulative National Equipment and Operating Costs with NPV from 2012–2042, Seven-Percent Discount Rate (billion 2006\$)

Standard Level*	Equipment	Operating	Total
Base Case	7.53	7.46	14.98
CSL 1 / TSL 4	14.90	7.38	22.28
Difference**	-7.37	0.07	<i>-7.30</i>

* TSLs 1, 2, 3 equal the baseline level.

** Equipment Cost Difference represents the *PVC*; Operating Cost Difference represents the *PVC*; *NPV* is represented by the bold and italicized values.

Table 11B.2.4 Electric Smooth Cooktops: Cumulative National Equipment and Operating Costs with NPV from 2012–2042, Three-Percent Discount Rate (billion 2006\$)

Standard Level*	Equipment	Operating	Total
Base Case	14.44	16.77	31.21
CSL 1 / TSL 4	28.59	16.58	45.16
Difference**	-14.14	0.19	<i>-13.95</i>

* TSLs 1, 2, 3 equal the baseline level.

** Equipment Cost Difference represents the *PVC*; Operating Cost Difference represents the *PVC*; *NPV* is represented by the bold and italicized values.

Tables 11B.2.5 and 11B.2.6 show the costs, *PVC*, *PVS*, and *NPV* for gas cooktops at real discount rates of seven- and three-percent respectively.

Table 11B.2.5 Gas Cooktops: Cumulative National Equipment and Operating Costs with NPV from 2012–2042, Seven-Percent Discount Rate (billion 2006\$)

Standard Level	Equipment	Operating	Total
Base Case	10.09	12.57	22.66
CSL 1 / TSL 1, 2, 3	10.19	12.25	22.44
Difference*	-0.10	0.32	<i>0.22</i>
Base Case	10.09	12.57	22.66
CSL 2 / TSL 4	11.30	12.04	23.34
Difference*	-1.21	0.52	<i>-0.69</i>

* Equipment Cost Difference represents the *PVC*; Operating Cost Difference represents the *PVC*; *NPV* is represented by the bold and italicized values.

Table 11B.2.6 Gas Cooktops: Cumulative National Equipment and Operating Costs with NPV from 2012–2042, Three-Percent Discount Rate (billion 2006\$)

Standard Level	Equipment	Operating	Total
Base Case	19.19	27.33	46.52
CSL 1 / TSL 1, 2, 3	19.36	26.60	45.96
Difference*	-0.17	0.73	<i>0.56</i>
Base Case	19.19	27.33	46.52
CSL 2 / TSL 4	21.47	26.06	47.53
Difference*	-2.28	1.27	<i>-1.01</i>

* Equipment Cost Difference represents the *PVC*; Operating Cost Difference represents the *PVC*; *NPV* is represented by the bold and italicized values.

11B.2.2 Ovens

Tables 11B.2.7–11B.2.14 present the national equipment and operating costs, *PVC*, *PVS*, and *NPV* for ovens. In the case of electric and gas ovens, because the housing market is fully saturated (i.e., all households have ovens either in the form of ranges or stand-alone units), DOE assumed that standards would neither impact shipments nor cause shifts in electric and gas oven market shares. Therefore, DOE’s standards case shipments for electric and gas ovens were identical to its base case shipments. Typically, DOE would use the standards case shipments projection and, in turn, the standards case equipment stock, to determine the *NPV* to avoid the inclusion of savings due to displaced shipments. But because DOE assumed no drop in shipments due to standards, DOE maintained the use of the base case shipments to determine the annual energy consumption in the base case. Thus, the base case values shown in Tables 11B.2.7–11B.2.14 do not vary with the standards case.

Tables 11B.2.7 and 11B.2.8 show the costs, *PVC*, *PVS*, and *NPV* for electric standard ovens at real discount rates of seven- and three-percent respectively.

Table 11B.2.7 Electric Standard Ovens: Cumulative National Equipment and Operating Costs with NPV from 2012–2042, Seven-Percent Discount Rate (billion 2006\$)

Standard Level*	Equipment	Operating	Total
Base Case	5.16	4.88	10.04
CSL 1	5.20	4.76	9.96
Difference**	-0.04	0.12	<i>0.09</i>
Base Case	5.16	4.88	10.04
CSL 2 / TSL 2, 3	5.27	4.64	9.91
Difference**	-0.10	0.24	<i>0.13</i>
Base Case	5.16	4.88	10.04
CSL 3	5.35	4.60	9.95
Difference**	-0.19	0.28	<i>0.09</i>
Base Case	5.16	4.88	10.04
CSL 4	6.21	4.55	10.76
Difference**	-1.04	0.33	<i>-0.71</i>
Base Case	5.16	4.88	10.04
CSL 5 / TSL 4	6.28	4.54	10.83
Difference**	-1.12	0.34	<i>-0.78</i>

* TSL 1 equals the baseline level.

** Equipment Cost Difference represents the *PVC*; Operating Cost Difference represents the *PVC*; *NPV* is represented by the bold and italicized values.

Table 11B.2.8 Electric Standard Ovens: Cumulative National Equipment and Operating Costs with NPV from 2012–2042, Three-Percent Discount Rate (billion 2006\$)

Standard Level	Equipment	Operating	Total
Base Case	9.91	10.84	20.74
CSL 1	9.97	10.52	20.49
Difference**	-0.07	0.32	<i>0.25</i>
Base Case	9.91	10.84	20.74
CSL 2 / TSL 2, 3	10.11	10.21	20.31
Difference**	-0.20	0.63	<i>0.43</i>
Base Case	9.91	10.84	20.74
CSL 3	10.26	10.10	20.36
Difference**	-0.36	0.74	<i>0.38</i>
Base Case	9.91	10.84	20.74
CSL 4	11.91	9.96	21.87
Difference**	-2.00	0.87	<i>-1.13</i>
Base Case	9.91	10.84	20.74
CSL 5 / TSL 4	12.06	9.94	22.00
Difference**	-2.15	0.89	<i>-1.26</i>

* TSL 1 equals the baseline level.

** Equipment Cost Difference represents the *PVC*; Operating Cost Difference represents the *PVC*; *NPV* is represented by the bold and italicized values.

Tables 11B.2.9 and 11B.2.10 show the costs, *PVC*, *PVS*, and *NPV* for electric self-cleaning ovens at real discount rates of seven- and three-percent respectively.

Table 11B.2.9 Electric Self-Cleaning Ovens: Cumulative National Equipment and Operating Costs with NPV from 2012–2042, Seven-Percent Discount Rate (billion 2006\$)

Standard Level*	Equipment	Operating	Total
Base Case	19.74	14.95	34.69
CSL 1	20.03	14.92	34.96
Difference**	-0.29	0.02	-0.27
Base Case	19.74	14.95	34.69
CSL 2 / TSL 4	22.69	14.77	37.46
Difference**	-2.95	0.18	-2.77

* TSLs 1, 2, 3 equal the baseline level.

** Equipment Cost Difference represents the *PVC*; Operating Cost Difference represents the *PVC*; *NPV* is represented by the bold and italicized values.

Table 11B.2.10 Electric Self-Cleaning Ovens: Cumulative National Equipment and Operating Costs with NPV from 2012–2042, Three-Percent Discount Rate (billion 2006\$)

Standard Level*	Equipment	Operating	Total
Base Case	37.88	33.69	71.58
CSL 1	38.45	33.63	72.08
Difference**	-0.56	0.07	-0.50
Base Case	37.88	33.69	71.58
CSL 2 / TSL 4	43.55	33.21	76.76
Difference**	-5.66	0.48	-5.18

* TSLs 1, 2, 3 equal the baseline level.

** Equipment Cost Difference represents the *PVC*; Operating Cost Difference represents the *PVC*; *NPV* is represented by the bold and italicized values.

Tables 11B.2.11 and 11B.2.12 show the costs, *PVC*, *PVS*, and *NPV* for gas standard ovens at real discount rates of seven- and three-percent respectively.

Table 11B.2.11 Gas Standard Ovens: Cumulative National Equipment and Operating Costs with NPV from 2012–2042, Seven-Percent Discount Rate (billion 2006\$)

Standard Level	Equipment	Operating	Total
Base Case	5.56	8.77	14.33
CSL 1	5.67	8.84	14.50
Difference*	-0.10	-0.06	-0.17
Base Case	5.56	8.77	14.33
CSL 2	5.74	8.96	14.70
Difference*	-0.18	-0.19	-0.36
Base Case	5.56	8.77	14.33
CSL 3	5.76	8.94	14.70
Difference*	-0.20	-0.17	-0.37
Base Case	5.56	8.77	14.33
CSL 4	6.24	8.90	15.14
Difference*	-0.68	-0.12	-0.80
Base Case	5.56	8.77	14.33
CSL 5	6.27	8.89	15.16
Difference*	-0.71	-0.12	-0.83
Base Case	5.56	8.77	14.33
CSL 6 / TSL 4	6.35	8.88	15.23
Difference*	-0.79	-0.10	-0.89
Base Case	5.56	8.77	14.33
CSL 1a / TSL 1, 2, 3	5.67	8.63	14.30
Difference*	-0.11	0.14	0.03

* Equipment Cost Difference represents the *PVC*; Operating Cost Difference represents the *PVC*; *NPV* is represented by the bold and italicized values.

Table 11B.2.12 Gas Standard Ovens: Cumulative National Equipment and Operating Costs with NPV from 2012–2042, Three-Percent Discount Rate (billion 2006\$)

Standard Level	Equipment	Operating	Total
Base Case	10.58	19.03	29.61
CSL 1	10.75	19.17	29.92
Difference*	-0.18	-0.14	-0.31
Base Case	10.58	19.03	29.61
CSL 2	10.89	19.49	30.38
Difference*	-0.31	-0.47	-0.78
Base Case	10.58	19.03	29.61
CSL 3	10.93	19.45	30.38
Difference*	-0.36	-0.42	-0.77
Base Case	10.58	19.03	29.61
CSL 4	11.84	19.33	31.16
Difference*	-1.26	-0.30	-1.56
Base Case	10.58	19.03	29.61
CSL 5	11.91	19.30	31.21
Difference*	-1.33	-0.27	-1.60
Base Case	10.58	19.03	29.61
CSL 6 / TSL 4	12.05	19.27	31.33
Difference*	-1.48	-0.24	-1.72
Base Case	10.58	19.03	29.61
CSL 1a / TSL 1, 2, 3	10.76	18.70	29.46
Difference*	-0.18	0.33	0.14

* Equipment Cost Difference represents the *PVC*; Operating Cost Difference represents the *PVC*; *NPV* is represented by the bold and italicized values.

Tables 11B.2.13 and 11B.2.14 show the costs, *PVC*, *PVS*, and *NPV* for gas self-cleaning ovens at real discount rates of seven- and three-percent respectively.

Table 11B.2.13 Gas Self-Cleaning Ovens: Cumulative National Equipment and Operating Costs with NPV from 2012–2042, Seven-Percent Discount Rate (billion 2006\$)

Standard Level*	Equipment	Operating	Total
Base Case	8.70	5.21	13.91
CSL 1 / TSL 3	8.99	4.91	13.90
Difference**	-0.29	0.30	<i>0.01</i>
Base Case	8.70	5.21	13.91
CSL 2	9.11	4.90	14.01
Difference**	-0.41	0.31	<i>-0.10</i>
Base Case	8.70	5.21	13.91
CSL 3 / TSL 4	9.14	4.89	14.02
Difference**	-0.44	0.33	<i>-0.11</i>

* TSLs 1, 2 equal the baseline level.

** Equipment Cost Difference represents the *PVC*; Operating Cost Difference represents the *PVC*; *NPV* is represented by the bold and italicized values.

Table 11B.2.14 Gas Self-Cleaning Ovens: Cumulative National Equipment and Operating Costs with NPV from 2012–2042, Three-Percent Discount Rate (billion 2006\$)

Standard Level*	Equipment	Operating	Total
Base Case	16.54	11.75	28.29
CSL 1 / TSL 3	17.09	10.94	28.03
Difference**	-0.56	0.81	<i>0.25</i>
Base Case	16.54	11.75	28.29
CSL 2	17.31	10.92	28.23
Difference**	-0.78	0.83	<i>0.05</i>
Base Case	16.54	11.75	28.29
CSL 3 / TSL 4	17.37	10.88	28.26
Difference**	-0.84	0.87	<i>0.03</i>

* TSLs 1, 2 equal the baseline level.

** Equipment Cost Difference represents the *PVC*; Operating Cost Difference represents the *PVC*; *NPV* is represented by the bold and italicized values.

11B.2.3 Microwave Ovens

Tables 11B.2.15–11B.2.18 present the national equipment and operating costs, *PVC*, *PVS*, and *NPV* for microwave ovens at real discount rates of seven- and three-percent respectively.

All base case values were determined with shipments projections established under the standards case. As detailed in Chapter 11, shipments projections under the standards cases were determined to be lower than those in the base case projection due to the higher installed cost of the more efficient equipment. As a result, the standards case shipments projection and, in turn, the standards case equipment stock, were used to determine the *NPV* to avoid the inclusion of

savings due to displaced shipments. Thus, the base case values shown in Tables 11B.2.15 to 11B.2.18 vary with the standards case. Both the CSL and TSL are identified in the following tables.

Table 11B.2.15 Microwave Ovens by EF: Cumulative National Equipment and Operating Costs with NPV from 2012–2042, Seven-Percent Discount Rate (billion 2006\$)

Standard Level	Equipment	Operating	Total
Base Case	36.14	25.05	61.20
CSL 1 / TSL 1	38.22	24.21	62.43
Difference*	-2.07	0.84	-1.23
Base Case	35.49	24.68	60.18
CSL 2 / TSL 2	39.70	23.80	63.51
Difference*	-4.21	0.88	-3.33
Base Case	34.48	24.11	58.59
CSL 3 / TSL 3	41.90	23.02	64.92
Difference*	-7.41	1.09	-6.32
Base Case	33.22	23.39	56.61
CSL 4 / TSL 4	44.44	22.22	66.66
Difference*	-11.22	1.17	-10.05

* Equipment Cost Difference represents the *PVC*; Operating Cost Difference represents the *PVC*; *NPV* is represented by the bold and italicized values.

Table 11B.2.16 Microwave Ovens by EF: Cumulative National Equipment and Operating Costs with NPV from 2012–2042, Three-Percent Discount Rate (billion 2006\$)

Standard Level	Equipment	Operating	Total
Base Case	69.14	51.99	121.13
CSL 1 / TSL 1	73.11	50.09	123.19
Difference*	-3.97	1.90	-2.06
Base Case	67.79	51.08	118.87
CSL 2 / TSL 2	75.84	49.09	124.93
Difference*	-8.04	1.99	-6.05
Base Case	65.71	49.68	115.38
CSL 3 / TSL 3	79.83	47.23	127.06
Difference*	-14.13	2.45	-11.68
Base Case	63.11	47.93	111.04
CSL 4 / TSL 4	84.43	45.31	129.74
Difference*	-21.32	2.62	-18.70

* Equipment Cost Difference represents the *PVC*; Operating Cost Difference represents the *PVC*; *NPV* is represented by the bold and italicized values.